

## IPHITIME AND CERATOCEPHALA (POLYCHAETOUS ANNELIDS) FROM CALIFORNIA\*

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The purpose of this paper is to call attention to the presence of two new marine annelids from California, belonging to two rare genera that have remained unreported, one from the Western Hemisphere, the other from the western part of North America. The first, *Iphitime loxorhynchi*, new species, is a member of the family LYSARETIDAE, superfamily EUNICEA; the second *Ceratocephala crosslandi americana*, new subspecies, belongs to the family NEREIDAE.

I am indebted to Professor and Mrs. George E. MacGinitie, who first called my attention to the presence of annelids within the carapace of the kelp-crab, *Loxorhynchus grandis* Stimpson, and who, with Dr. C. A. G. Wiersma, collected many specimens from Southern California. The late Dr. Shiro Okuda of Hokkaido University, sent me specimens of *Iphitime döderleini* Marenzeller from Japan, for comparison. For the nereids I owe thanks to the cruising staffs of the *E. W. Scripps*, Scripps Institution of Oceanography, and the *Velero IV*, University of Southern California. Anker Petersen, staff artist of the Allan Hancock Foundation, prepared the illustrations for the two plates. I am especially indebted to the Administration of the Allan Hancock Foundation for permitting the study of these materials. Type specimens are deposited in the Allan Hancock Foundation.

### LYSARETIDAE Kinberg, 1865

This family is largely tropical in its occurrence. It is known for few (possibly seven or eight) species belonging to four genera: *Lysarete* Kinberg, 1865, *Halla* Costa, 1844, *Aglaurides* Ehlers, 1864-68 and *Iphitime* Marenzeller, 1902. All of the species, except those of *Iphitime*, are free-living and come to attain considerable size; thus, *Halla parthenopeia* (delle Chiaje), an important fish-bait worm in some parts of the world, may come to be 90 cm (about three feet) long (Okuda, 1933, pp. 243-247). *Iphitime* is known only from the branchial chambers of Crustacea, and its representatives do not attain such great size.

Most of the lysaretids are brightly colored in life; they are errantiate in their habitat and foraging or predaceous, attacking lamellibranchs or other organisms by enveloping their victims with mucous secretions. Some, when placed under unfavorable conditions, emit a dark violet secretion (Okuda, 1933, p. 246). The species of *Iphitime* are not highly colored, can be presumed to be nestling in their habitat, and may feed only on the minute particles of food that are carried into the branchial compartments

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by water currents. Nothing is known of the origin of the worm, of its fate at ecdysis of the crab, or of its means of reproduction. There are no records of *Iphitime* having been taken outside of the crab. Whether the species are host-specific may be doubted, since some records (see below) indicate otherwise.

Another representative of the EUNICEA, *Ophryotrocha geryonicola* (Bidenkap), is also an inhabitant of the branchial chamber of a crab, *Geryon tridens* Kröyer, in western Europe. In this case it has been suggested that the commensal stage is possibly a modified one of the free-living *Ophryotrocha puerilis* (Claparède and Metchnikow) (see Wesenberg-Lund, 1938, p. 13).

There is no known homologous, free-living stage for species of *Iphitime*. The crab-dwelling individuals of this genus cannot thus be considered to represent trapped stages of a free-living form. Furthermore, the entire maxillary apparatus, the parapodial lobes and setae, as well as other body parts are considerably modified from the typical, errantiate lysaretid body.

*Iphitime* Marenzeller, 1902

Type 1. *döderleini* Marenzeller, 1902

Most of the literature on *Iphitime* has been assembled (Fage and Legendre, 1934, pp. 299-305). This includes descriptive accounts of three species. A fourth one is herewith added. These are:

1. *döderleini* Marenzeller, 1902, from south Japan, with host *Macrocheira kaempferi* de Haan.
1. *cucnoti* Fauvel, 1914, from France, with hosts including species of *Portunus*, *Gonoplax*, *Macropodia* and *Maia*.
1. *paguri* Fage and Legendre, 1934, from France, with hosts including brachyuran and anomuran crabs.
1. *loxorhynchi*, new species, from California, with host *Loxorhynchus grandis* Stimpson.

*Iphitime* is characterized for having a greatly reduced prostomium that lacks eyes. Its frontal margin has a single pair of small ovoid antennae. The first two segments are achaetous, smooth rings. Parapodia occur from the third segment and are entirely uniramous. On the eversible pharynx the maxillary apparatus is greatly reduced. When retracted it can be seen as a small dark mass lying in about the second segment. The maxillae or dorsal pieces consist of a pair of larger forceps, followed by a few smaller pieces in paired tandem, numbering only a single pair, or few more. The mandibles or ventral pieces consist of a pair of medially fused long pieces, with outer lateral wings at the anterior or cutting edge. Parapodia consist of a pair of simple lobes between which the setae project; there are no ventral cirri. Setae include simple and composite ones; all are falcate. Branchiae are segmental and present on most body segments; they are simple or branched.

The chief specific characters are those concerned with the distribution of branchiae, their degree of branching, the position of the branchial base on the parapodium, and the details concerning the setae.

***Ip hitime loxorhynchi*, new species**

Plate 3, figs. 1-6

Many individuals come from off Corona del Mar and other localities in southern California, from the branchial chambers of the sheep-crab or kelp-crab, *Loxorhynchus grandis* Stimpson. Length of a larger, ovigerous female individual is 60 to 70 mm; number of segments is 200 or more. This is thus the largest of the known species of the genus (see chart below for details). The prostomium is a small, subquadrate lobe provided with a pair of minute antennae at the anterior margin (fig. 1); there are no eyes or other accessory parts. The proboscis, seen by dissection, is provided with mandibles fused medially at its distal part; their outer margins are enlarged as a pair of thin lateral plates (fig. 6) the dorsal maxillae include a pair of large forceps and smaller distal pieces, the right one with four or five short teeth, the left one smooth (fig. 6).

Branchiae are first present from the second setigerous segment and already long but the next are half again as long. In most instances the branchiae are simple, cylindrical processes (figs. 2, 3); in others they are somewhat branched, especially in their distal parts (fig. 1). The main branchial stem is directed obliquely outward. Its origin is somewhat above the superior parapodial base.

Parapodia are lateral, consist of a dorsally directed upper lobe (figs. 2, 3); the setae project from between their anterior and posterior lobes. Posterior (fig. 3) resemble median (fig. 2) parapodia except for decreasing size. All acicula and setae are pale yellow. Typically the parapodia have 20 or more simple hooks (fig. 4) above, about 6 similar ones below the acicula and 20 or more composite hooks. Acicula number about 6 or more in a parapodium; each is a slender, tapering rod. The composite hooks (fig. 5) have an appendage that is falcate. Simple setae (fig. 4) resemble the composite hooks but have no articulation.

In mature specimens there are lozenge-shaped ova, present from about the seventeenth setigerous segment and continued back to near the posterior end. The ova are very numerous and crowded, such that they are pushed upward into the branchial bases for about half the branchial length.

There is no color remaining in preserved individuals. In life they may be pale red or pink, owing to the color of the blood. There are few to many, possibly ten or more individuals from single crab hosts, and worms are sometimes present in both branchial chambers.

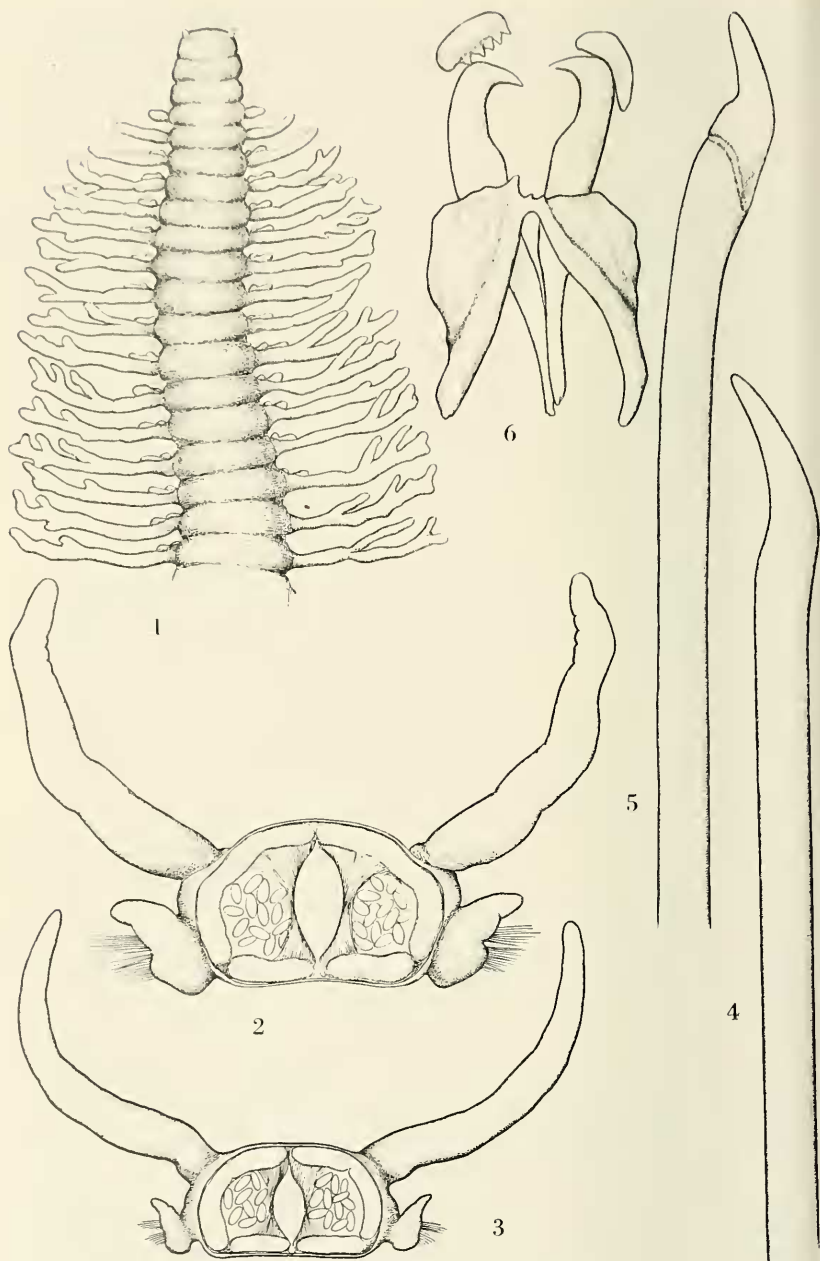


Plate 3

The specific name of the worm refers to the generic name of the host, *Loxorhynchus grandis*, Stimpson, which has a reported range (Rathbun, 1925, pp. 198-199) of central California to Baja California, Mexico, in depths to 68 fms. This represents the first record of the genus *Iphitime* Marenzeller from the Western Hemisphere. The following chart outlines the chief characteristics for species of the genus, and gives distributional data with host species.

#### NEREIDAE Blainville, 1818

In members of the family NEREIDAE the eversible proboscis is a strong, muscular organ differentiated into an oral and maxillary ring; it terminates distally in a pair of horny jaw pieces. The areas on the maxillary ring are numbered from I to IV, those on the oral ring V to VIII; typically the areas are provided with structures generically and specifically differentiated. In the great majority the pieces are horny brown or black, called paragnaths (*Nereis* and *Neanthes*), or pectinae (*Platynereis*), or ridges (*Perinereis*). In one group, *Leonnates* Kinberg, the pieces are horny on the maxillary, and soft and membranous on the oral ring. In comparatively few genera the processes are totally lacking; such are the genera *Dendronereis* Peters, *Kainonereis* Chamberlin, *Leptonereis* Kinberg, *Lycastoides* Johnson, *Lycastopsis* Augener, *Micronereis* Claparède, *Namanereis* Chamberlin and *Nicon* Kinberg. In a still smaller group of species the processes on the proboscis are present as soft, membranous, short to long papillar structures; they may be present on both oral and maxillary rings, as in the genera *Chinonereis* Chamberlin, *Dendronereides* Southern, *Laeonereis* Hartman, *Tylonereis* Fauvel and *Tylorrhynchus* Grube, or they may be present on only the oral ring, as in *Ceratocephala* Malmgren.

At present, the genera characterized for the presence of soft, membranous proboscidial processes, are rather weakly differentiated and generally little known. Most of these genera have single or few species attributed to them. Many of them are inhabitants of brackish or freshwater and widely dispersed geographically. At least two, those of *Tylorrhynchus* and *Chinonereis*, are pests in rice paddies, in eastern and southern Asia; *Dendronereides* is known for a single freshwater species from India; *Tylonereis* is known for only two species, both from southern Asia, and

#### EXPLANATION OF PLATE 3

##### *Iphitime loxorhynchi*, new species

Fig. 1. Anterior end in dorsal view, x 8.5.

Fig. 2. Median parapodium in posterior view, x 16.

Fig. 3. Posterior parapodium in posterview view, x 16.

Fig. 4. A superior simple hook, x 1068.

Fig. 5. An inferior composite hook, x 1068.

Fig. 6. Paragnathal apparatus, with mandibles and maxillae in ventral view, x 146.



Chart for Species of *Iphitime* with diagnostic characteristics and distributional data

Name of Species	Total length in mm.	Host Species and locality	Number of setigerous segments	First presence of Branchiae, and character	Parapodial Components
<i>I. loxorhynchis</i> Hartman	60-70	<i>Loxorhynchus grandis</i> Southern California	200 or more	Second; simple to divided, inserted laterally	About 20 simple supra-acicular, 20 composite hooks, 6 simple sub-acicular hooks and about 6 acicula
<i>I. döderleini</i> Marenzeller	61	<i>Macrocheira kaempferi</i> Japan	185 to 210	First; simple and palmate from 9th, with to 9 lobes, inserted midlaterally	Many composite hooks, 10 large and 4-5 small, simple hooks, and about 4 acicula
<i>I. cuenoti</i> Fauvel	7-12	<i>Maia squinado</i> <i>Portunus</i> spp. <i>Gonoplax angulata</i> <i>Macropodia longirostris</i> All from Europe	20-60	First; digitiform to divided, inserted laterally	About 20 composite hooks and 4 or 5 simple hooks.
<i>I. paguri</i> Fage & Legendre	7	<i>Gonoplax angulata</i> <i>Macropodia longirostris</i> <i>Portunus depurator</i> <i>Eupagurus bernhardus</i> All from Europe	86-90	Fourth; digitiform, inserted dorsally	7 or 8 composite hooks and one simple hook.

*Laeonereis* is known for perhaps half a dozen species from widely scattered localities. *Ceratocephala* is known for few species (see chart below) and all are marine though in widely scattered geographic areas.

Key to Genera of NEREIDAE in which the Proboscoidal

Processes are soft and membranous

- |   |                       |
|---|-----------------------|
| 1. Pharyngeal processes limited to the oral ring<br>(pl. 2, fig. 1).....                        | <i>Ceratocephala</i>  |
| 1. Pharyngeal processes present on both oral<br>maxillary rings .....                           | 2                     |
| 2. Parapodia with branchiae in the form of fila-<br>ments inserted below the dorsal cirrus..... | <i>Dendronereides</i> |
| 2. Parapodia without branchiae.....   | 3                     |
| 3. Proboscis provided with tufts of papillae.....   | <i>Laeonereis</i>     |
| 3. These papillae single, not in tufts.....   | 4                     |
| 4. Setae include spinigers and falcigers.....   | <i>Tylorrhynchus</i>  |
| 4. Setae are entirely spinigers.....  | 5                     |
| 5. Setae have an articulation that is heterogomph .....   | <i>Chinonereis</i>    |
| 5. Setae have an articulation that is homogomph .....   | <i>Tylonereis</i>     |

*Ceratocephala* Malmgren, 1867

Type *C. loveni* Malmgren

This genus is characterized for having a prostomium that is proportionately wide; its frontal margin is incised between the bases of the paired antennae; the palpi are spreading, and prostomial eyes are reduced or absent. The eversible proboscis has distal jaws that lack teeth. The maxillary ring is bare; the oral ring has a few soft, conical processes in single, or partially double, transverse rows. The first two parapodia are uniramous, more posterior ones are biramous. Ventral cirri (usually) are double in some or all segments. Setae are entirely composite spinigers, with an appendage that is blade-like and with few or no spinelets along the cutting edge.

The few known species are distinguished from one another for the presence or absence of eyes, the character of the dorsal cirrophore, and the proportionate lengths of parapodial lobes. Since most of the species are known only from anterior, dredged ends, a comparison of far posterior parapodia is not possible. The occurrence of epitoky is known for at least one species, from the Dutch East Indies.

The following species are known:

- C. loveni* Malmgren, 1867, from western Sweden and northeastern America, dredged from moderate depths.
- C. sibogae* Horst, 1924, off the Dutch East Indies, 11 m to surface, and more recently recorded from Littoral sands of South America (Fauvel, 1936, pp. 24-28).
- C. crosslandi* (Monro), 1933, from Gorgona Island, Pacific Panama, 30 fms.

*C. borealis* Wesenberg-Lund, 1950, from western Greenland, 599 and 1096 m.

Another, close to *C. crosslandi* Monro, has recently been recovered from southern California; it is herewith described as subspecies *americana*, new.

Key to Species of *Ceratocephala* Malmgren

- |   |                                |
|---|--------------------------------|
| 1. Prostomium without eyes .....  | 2                              |
| 1. Prostomium with 4 eyes in quadrate arrangement .....   | 3                              |
| 2. Proboscis with 2 rows of soft papillae on areas VII-VIII .....                                     | <i>C. loveni</i>               |
| 2. Proboscis with a single row of papillae on areas VII-VIII .....                                    | <i>C. borealis</i>             |
| 3. Dorsal cirrophore with a large triangular lobe lateral to base of dorsal cirrus.....               | <i>C. sibogae</i>              |
| 3. Dorsal cirrophore without a triangular lobe lateral to base of dorsal cirrus.....                  | 4                              |
| 4. Dorsal cirrus of first 2 segments simple; ventral cirrus double throughout.....                    | <i>C. crosslandi</i>           |
| 4. Dorsal cirrus of first 2 segments double; ventral cirrus becoming simple at about segment 35 ..... | <i>C. crosslandi americana</i> |

*Ceratocephala crosslandi americana*, new subspecies

Plate 4, figs. 1-3)

*Chaunorhynchus crosslandi* Monro, 1933, pp. 46-49, figs. 20 a-f (stem species).

There are two finds, the larger one comes from off Lower California, Mexico, 29° 34' 15" N., 115° 48' W, in 53-54 fms, April 15, 1951, green mud; the other was dredged off La Jolla, California, in less than 50 fms, April, 1938. Both are anterior ends; the larger has the proboscis everted, the other has it retracted.

The larger measures 19 mm long for 16 segments and 2 mm wide without parapodia; the smaller one measures 19 mm long for 40 segments and is about 1 mm wide. On the everted proboscis the distal paired jaws are translucent dark horny brown; the cutting edge is entire. The maxillary ring is smooth; the oral ring has transversely arranged conical processes. Areas V and VI have one each (fig. 1). Areas VII and VIII are continuous, with a single row of 7 soft cones; in addition there is a pair of transverse short ridges on each side, toward the mouth and at the lateral edges of the oral papillae (fig. 2.).

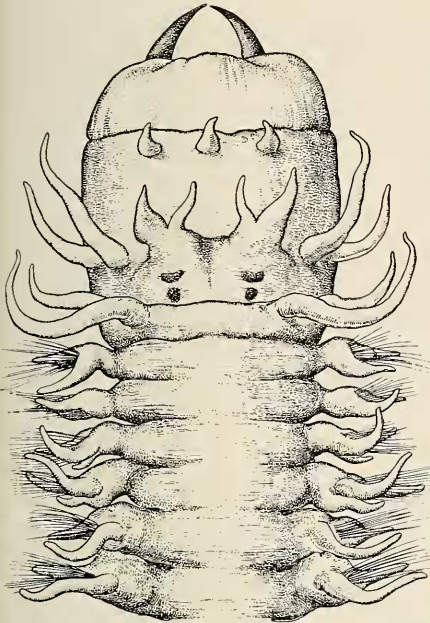
The prostomium is wider than long; it has a pair of large frontal antennae widely separated medially. The palpi are only slightly larger than the antennae. There are 4 dark eyes in trape-

EXPLANATION OF PLATE 4

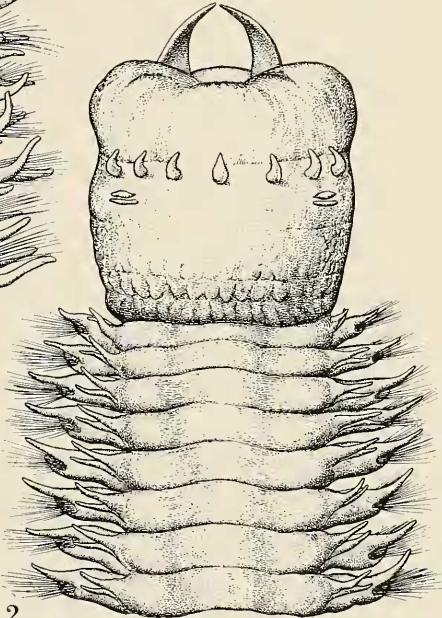
*Ceratocephala crosslandi americana*, new subspecies

- Fig. 1. Anterior end in dorsal view, with proboscis everted, x 14.5.  
 Fig. 2. Anterior end in ventral view, with proboscis everted, x 14.5.  
 Fig. 3. Fourteenth parapodium in anterior view, x 42.5.

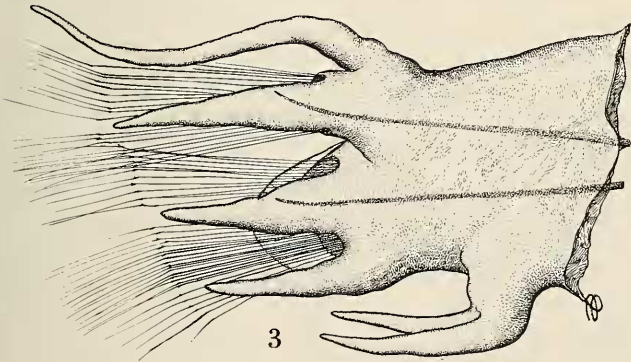




1



2



3

Plate 4

zoidal arrangement; the anterior are larger and wider apart than the posterior eyes. All have large, pale, circular lenses that cover most of the distal disk, when seen from above. The 4 pairs of peristomial cirri have the proportions shown in figures 1 and 2. The first visible body ring lacks parapodia. The next 2 segments have uniramous parapodia and thereafter the parapodia are clearly biramous.

The dorsal cirrus of the first two segments is unique for being double; it consists of a main dorsal branch; from its lower base there arises a secondary cirrus that is about half as large as the main one; this accessory dorsal cirrus is the same on both first and second segments of both specimens, hence probably normal. Thereafter, through a few segments, this accessory cirrus is visible as a slight boss at the base of the main dorsal cirrus and gradually vanishes.

Biramous parapodia are long, directed laterally and resemble those in other species of the genus. The dorsal cirrus is long, slender, distally tapering; in anterior segments it seems to arise directly from the body wall. In more posterior segments the cirrophore is visible as a low base, and by segment 35-40 it comes to be about as large as its respective notoacicular lobe. The presetal acicular lobe is long, slender, triangular and resembles the corresponding neuropodial one but is longer. The postsetal lobes of both notopodia and neuropodia are broadly rounded, short, the neuropodial surpassing the notopodial one in length and depth (fig. 3). A similarly long inferior lobe is present at the inferior, anterior position of the parapodium. The proportions of these parts vary little through the first 35 to 40 segments.

The ventral cirrus is double from the first parapodium; its upper branch is slightly longer and broader than the lower one. Farther back it continues double but the lower branch decreases in size so that by segment 21 the lower branch is only about half as long as the upper one. Between segments 30 to 40 the lower one vanishes altogether as a low knob, at the lower proximal base of the main cirrus. It is possible that the ventral cirrus may be single in the posterior region of the body.

Acicula are dark, slender, distally tapering; they occur singly in the branches of the parapodia. Setae are entirely composite, spinigerous, with the appendage long and slender, and with the cutting edge nearly or quite smooth. Setae are in dense fascicles in anterior parapodia and diminish in number in middle segments.

The subspecies, *americana*, differs from the stem, *C. crosslandi* in that the dorsal cirrus of the first two segments is double, not single; the ventral cirrus of median segments comes to be single, and does not continue as a double process. Other differences are indicated on the chart, below.

The following chart outlines the chief features of the species of the genus *Ceratocephala*, with known distributional data.

Chart for Species of *Ceratocephala*, with diagnostic characteristics and distributional data

Name of Species	Locality	Processes on Proboscis	Character of ventral cirri	Prostomial eyes	Character of dorsal cirrophore in anterior segments
<i>C. loveni</i> Malmgren	Northwest Europe, Eastern Canada, New England; depths to 100 fms.	V and VI with one each, VII and VIII a continuous row of about 7 and a second row of about 3	Double throughout	Absent	Undeveloped
<i>C. sibogae</i> Horst	Off Dutch East Indies, 11 m. to surface	V with 2 papillae, no others present	Simple throughout	4; anterior smaller than posterior ones	A long, triangular lobe at base of dorsal cirrus
<i>C. sibogae</i> sensu Fauvel	Southern South America, in littoral sands	V and VI with 3 in a row; VII and VIII with 7 in a row	Double throughout	4 present	A long, triangular lobe at base of dorsal cirrus
<i>C. crosslandi</i> (Monro)	Gorgona Island, Panama, 30 fms.	V and VI with 3 in a row; VII and VIII with a single row of about 8 papillae	Double through 38 segments, not known thereafter	4 present	Undeveloped
<i>C. crosslandi</i> <i>americana</i>	Southern and Lower California, 54 fms. or less	V and VI with 3 in a row; VII and VIII with a row of 7, and 2 short ridges on each side	Double through anterior segments, becoming single at about segment 35	4 present; anterior larger and wider apart than posterior pair	Undeveloped
<i>C. borealis</i> Wesenberg-Lund	Western Greenland, 599 and 1096 m.	V and VI with 3 in a row; VII and VIII with 7 in a single row	Double throughout, insofar as known	Absent	Undeveloped

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